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A NEW KIND OF END-GLUED JOINT FOR THE HARDWOOD INDUSTRY

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Abstract.—A method has been developed for end- and edge-gluing short pieces of high-value hardwood lumber into long panels, using a curved end joint we call SEM (Serpentine End Matching). Panels containing SEM end joints are aesthetically pleasing and are suited for exposed applications such as in finished furniture.

Furniture plants generate large quantities of short leftover pieces of wood. End-jointing these short pieces to make longer lengths allows greater utilization of raw materials. Some furniture companies use square butt joints or finger joints to do this. Almost all this material is being used in core stock and unexposed upholstered-furniture parts because these conventional types of joints are considered aesthetically unpleasing for exposed applications.

Researchers at the Forest Products Marketing Laboratory have developed curved end joints called SEM¹ (Serpentine End Matching) for exposed applications. Curved end joints follow the grain pattern of the wood better than the conventional butt or finger

joints. The curved line of the SEM joint is less visible than the straight lines of the butt joint or finger joint (fig. 1).

Curved end joints cannot be made with conventional end-jointing equipment. However, use of tape-controlled or optical-head-controlled routers eliminates the machining obstacles.

Producing a Tight Curved End Joint

In end jointing, tightness of fit is essential. Though conventional finger joints or butt joints can be made easily with properly prepared cutterheads, curved end joints present another problem. The curved path of the cutterhead must be controlled precisely.

A curved end joint cannot be made by simply routing a curved path across a piece of wood and pushing the two resulting ends to-

¹ LUMBER PANELS WITH SERPENTINE JOINTS. Hugh W. Reynolds, Philip A. Araman, and Wesley R. Martin. Patent pending at the U. S. Department of Agriculture Office of the General Counsel, Washington, D. C.



Figure 1.—An end- and edge-joined panel after finishing (bleach, stain, and lacquer).

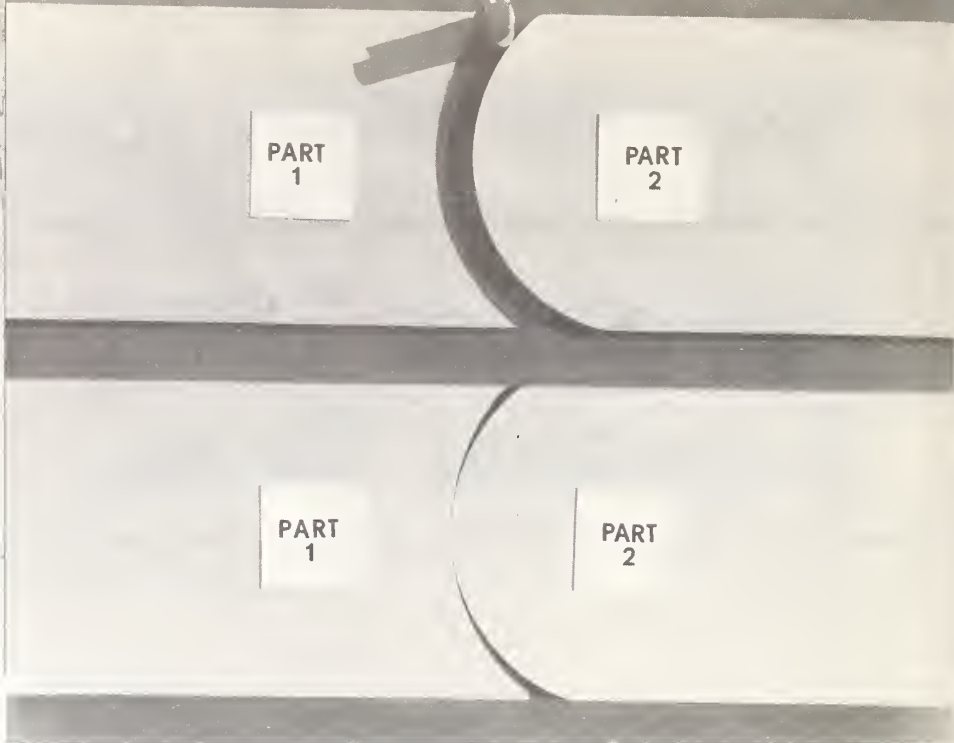


Figure 2.—A single cutterhead on a single path through a board results in two different curves.

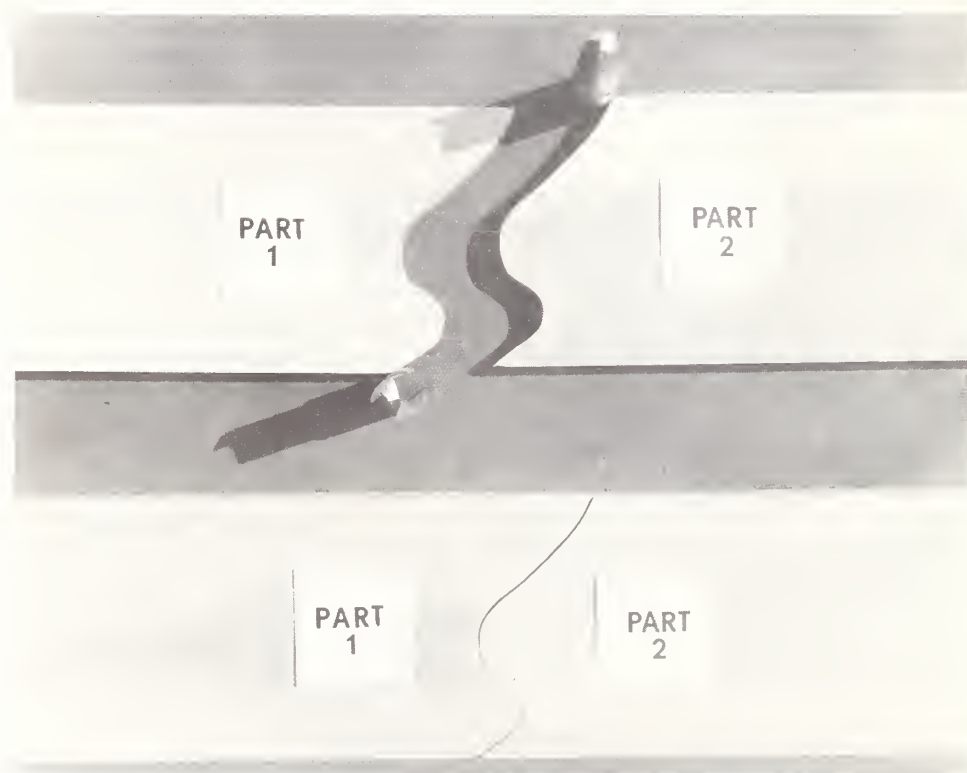


Figure 3.—Two operations, cutting opposite sides of the curve, produce a perfectly tight joint.

gether. A single cutterhead making a single cut through a board produces two different curves that do not fit (fig. 2). For making SEM joints, we used a single curve and a single cutterhead and machined opposite sides of the curve in two operations. The cutterhead follows the left side of the curve for the right part and the right side of the curve for the left part, producing a precisely fitting joint (fig. 3). Automatically controlled routers can produce these curved ends to the close tolerances required for tightness of fit.

Exploratory Study

To test the technical feasibility of the SEM joint, we conducted an exploratory study, using kiln-dried 4/4 No. 1 Common black walnut lumber to make end- and edge-glued panels. The lumber was ripped to eight different widths, from 1¼ to 3 inches, in ¼-inch increments, and was crosscut into random lengths to remove defects.

Several different 3-inch wide SEM curve patterns were used (fig. 4). With each pattern, any 3-inch wide cutting was cut to the full curve. Cuttings less than 3 inches wide used only part of the curve. The end joints were produced with an Ekstrom-Carlson tape-controlled router and a C. O. Porter auto-

matic optical-head-controlled router. (The use of trade names is for information only and should not be considered an endorsement by the Forest Service or the U. S. Department of Agriculture.)

After machining the SEM joints, we end-glued the pieces into strips 6 and 10 feet long. After ripping to produce straight glue-line edges, these strips were then edge-glued into 12-inch-wide panels.

The end joints ranged from almost invisible (where color and grain were similar) to clearly distinct (where sap and heart pieces were joined). After surfacing, sanding, and finishing (bleach, stain, and lacquer, or stain only), most of the joints became very difficult to see and were aesthetically pleasing (fig. 5).

Making these 6- and 10-foot SEM panels with end- and edge-gluing, we utilized 64 percent of the original sample of No. 1 Common black walnut lumber. The yield of rough cuttings was 71 percent, and only 7 percent was lost in machining the end joints and ripping the glue-line edges.

One reason for this high yield was our use of random-length cuttings. Cutting strips into ¼-inch increment widths seemed to have no effect on the yield.

To produce the same kind of 6-foot panels

Figure 4.—Examples of SEM 3-inch patterns that could be used for producing end joints.

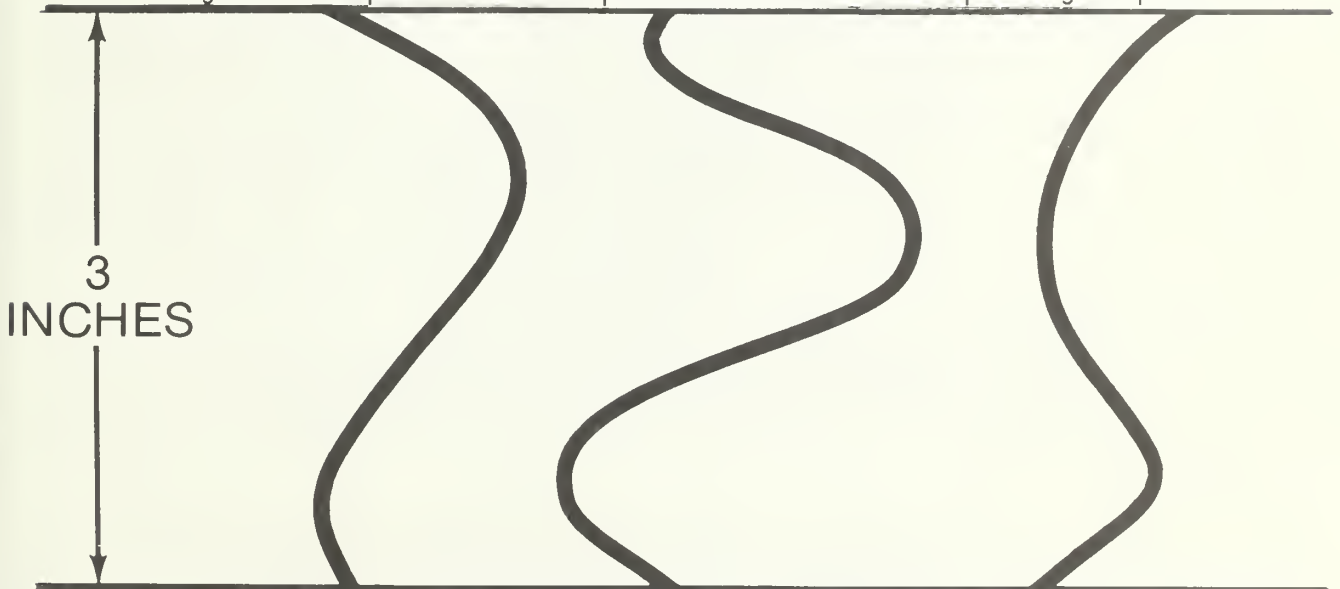




Figure 5.—A product made of SEM panels.

from random-width 6-foot-long strips of the same kind of lumber (No. 1 Common) would utilize only 13 percent of the raw material, according to walnut yield tables from the USDA Forest Products Laboratory (1971).

Moreover, SEM panels could be made in longer sizes without any reduction in yield, whereas the yield from making panels from edge-glued solid strips would decrease with any increase in length.

Comments

The SEM joint is technically feasible. Tightly fitted joints of different curvatures are easily made with automatically controlled routers. When wood grain and color are matched and a finish is applied, a well-hidden glue joint results.

SEM provides a method for using short lengths of high-value species for making aesthetically pleasing solid wood panels that can be processed for use in exposed wood products. Further research is under way to determine other methods of producing the joints, the effects of the joints in panels made of other species, and the economic potential of this process.

Literature Reference

Schumann, David R.
1971. DIMENSION YIELDS FROM BLACK WALNUT LUMBER. USDA Res. Pap. FPL-162, 17 p. Forest Prod. Lab., Madison, Wisc.

Acknowledgments

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